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To Mr. N.M. Thompson
Manager
Station and
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INFLUENCE OF 230-kV LINE ON CKPT RADIO STATION PATTERN

R.C. Madge

Field strength measurements of the day and night patterns of the CKPT radio broadcast antenna in Peterborough have been performed both before and after construction of the Marine JctxOtonabee TS 230-kV line. Differences between the before and after measurements can be attributed to the new line, to new construction near test points and between the antenna and test points, to locally changing ground conductivity and to operator error. Due to the nature of these contributors it is impossible to determine the effects of the transmission line by itself; however, it is expected to be relatively small and not crucial at any point.

The Marine JctxOtonabee TS 230-kV line passes within 925 metres of the closest antenna tower in the CKPT 4-antenna radio broadcast array in Peterborough. In order to determine the effect this line would have on the day and night patterns of the 1420 kHz CKPT radio station, measurements were taken both before construction and after completion of this line. This report deals with the comparisons of the two sets of measurements.

FIELD MEASUREMENTS

The 'before' tests were taken in early December, 1981. Brian Sawyer, broadcast consultant for CKPT, took the measurements with George Jones, representing CKPT, and Don Jones of Ontario Hydro, in attendance. The 'after' measurements were taken in late November, 1982. George Jones, and Rick Madge, of

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Ontario Hydro, took the measurements, with Don Jones, in attendance. Appendix A lists the operators and equipment used for the tests and Appendix C lists the test points and descriptions.

The 1981 tests were also used as supplementary proof of performance tests for CKPT, as required by the DOC. Because of this, the test points were already defined and were very close to the radio station antennas in the null pattern directions. With the introduction of the power line, the test points lay in the near field of the array formed by the radio station antennas and the transmission line towers acting as parasitic antennas. This should affect two areas in particular: low signal strength directions, and the test points closest to the transmission line. The test points closest to the transmission line should be affected because the towers, acting as parasitic antennas, will cause localized reradiation. The effects in the far field would be drastically different from the near field because of the difference in relative distances to the radio station antennas and the transmission towers. Some anomalies may therefore exist in the 10°-160° azimuthal range and would be accentuated in low field strength areas.

Areas of low 1981 field strength signal may also be affected, as the vector sum of signals from individual radio station antennas are carefully balanced to almost cancel. New signals from reradiators can therefore have more effect. If the reradiators are in the near field and more than one contribute to the new test point value, the finite and non-zero azimuth difference between the reradiators can add differently than in the far field. Test points with low 1981 signal can therefore be suspect in the 1982 tests.

Figure 1 shows a layout of the area.

ANALYSIS AND DISCUSSION OF RESULTS

The 'before' and 'after' tests were adjusted to 1 mile in order to compare these values with protections to other radio stations as listed by the DOC. The adjustments were made on the basis of ground radial field strength measurements carried out in December, 1981.

The values used for the 'after' test were agreed by the participants to be those taken by the Ontario Hydro operator. There was some question as to the linearity, and condition of the battery, of the meter used by the CKPT representative. The day and night measurements for both the 1981 and 1982 tests are listed in Appendix B.

Figures 2 and 3 show the comparisons of before and after tests for the day and night patterns respectively as corrected to 1 mile. The protections to co-channel and adjacent channel radio stations are shown as well.*

The variations observed can be due to a number of things. The new transmission line can cause some of the variations. Operator error can be responsible for some, as can locally changing ground conductivity. The ground conductivity is important to remember, as the radio signals propagate proportionately with the ground conductivity in the direction of propagation. Any changes from one year to the next will be reflected in changes in measured field strength at the test point in that direction.

Another potential contributor to the variation is construction of new buildings, either near the test point (causing localized reradiation) or between the antenna and the test point (affecting propagation of the signals).

These contributors are unknown quantities and the effect of each cannot be studied separately. The variations observed in Figures 2 and 3, therefore, are due to a number of things and not just to the new transmission line.

Figure 2 -the day pattern- shows one point of violation of protection at 142°. The extent of violation is very small and occurs in the azimuthal range influenced in the near field by the power line. It is also a low 1981 field strength point and therefore is subject to near field errors brought about by the power line.

Figure 3 -the night pattern- shows 2 points of violation, at 142° and 151°. However, both these points were violating protections in 1981 and the overall extent of violation has not increased in the 1982 tests. The test points are also in the azimuthal range influenced by the nearby power line and both had relatively low 1981 field strength readings.

Neither figure shows major problems arising from the presence of the new transmission line.

CONCLUSIONS

The test points used for the 'before' and 'after' measurements are close to the radio broadcast antenna and transmission line. As a result many of the critical test point measurements are

*The protections were provided by George Mathers, Radio Broadcast Consultant.

suspect. Variations observed can be attributed to the new power line, to new construction either near the test point or between the antenna and the test point, to locally changing ground conductivity and to operator error. Since these factors cannot be singled out and quantified, it cannot be shown that the transmission line has caused any variation. It is expected, however, that the variations are small and not crucial to the day and night patterns of the CKPT radio station.

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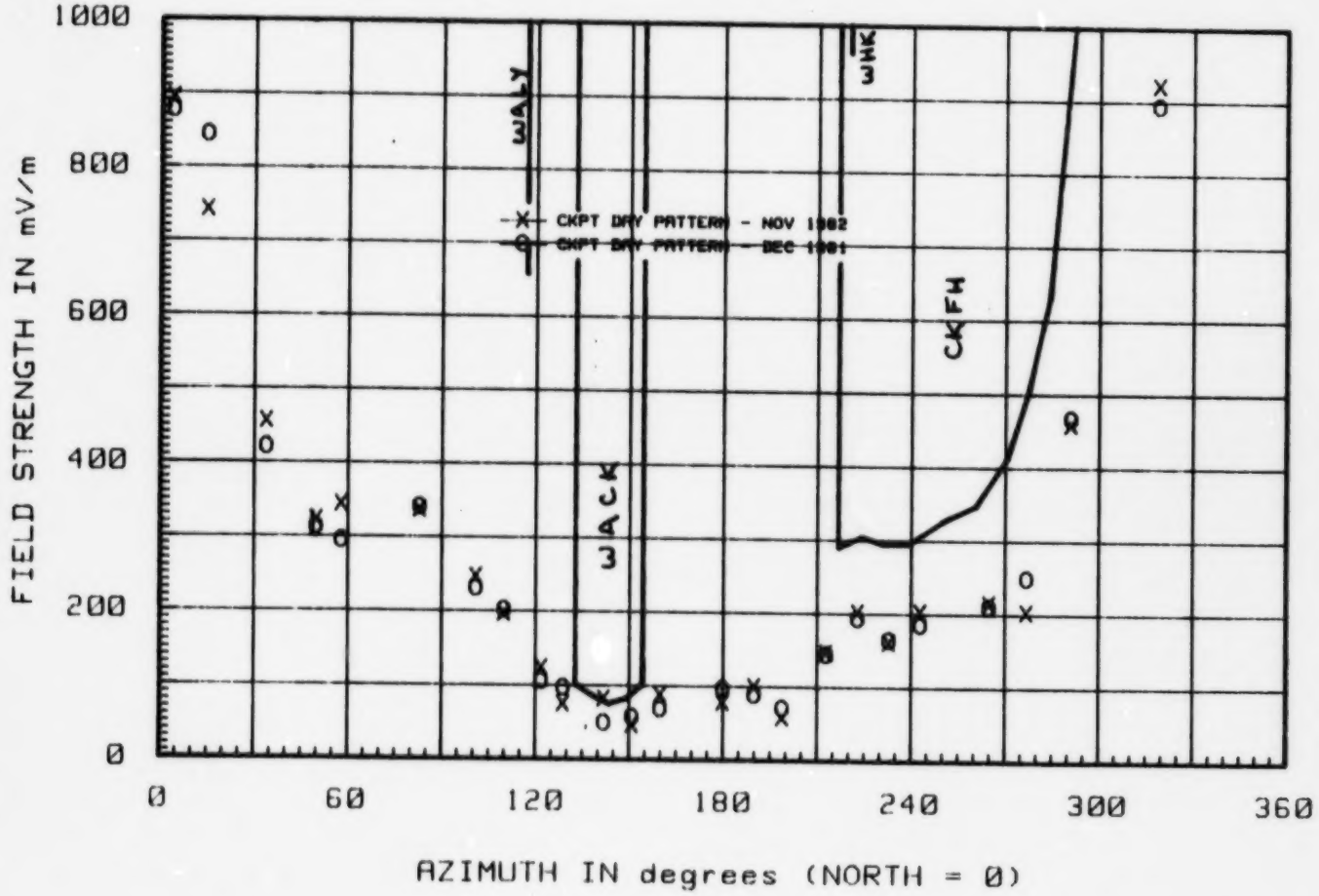
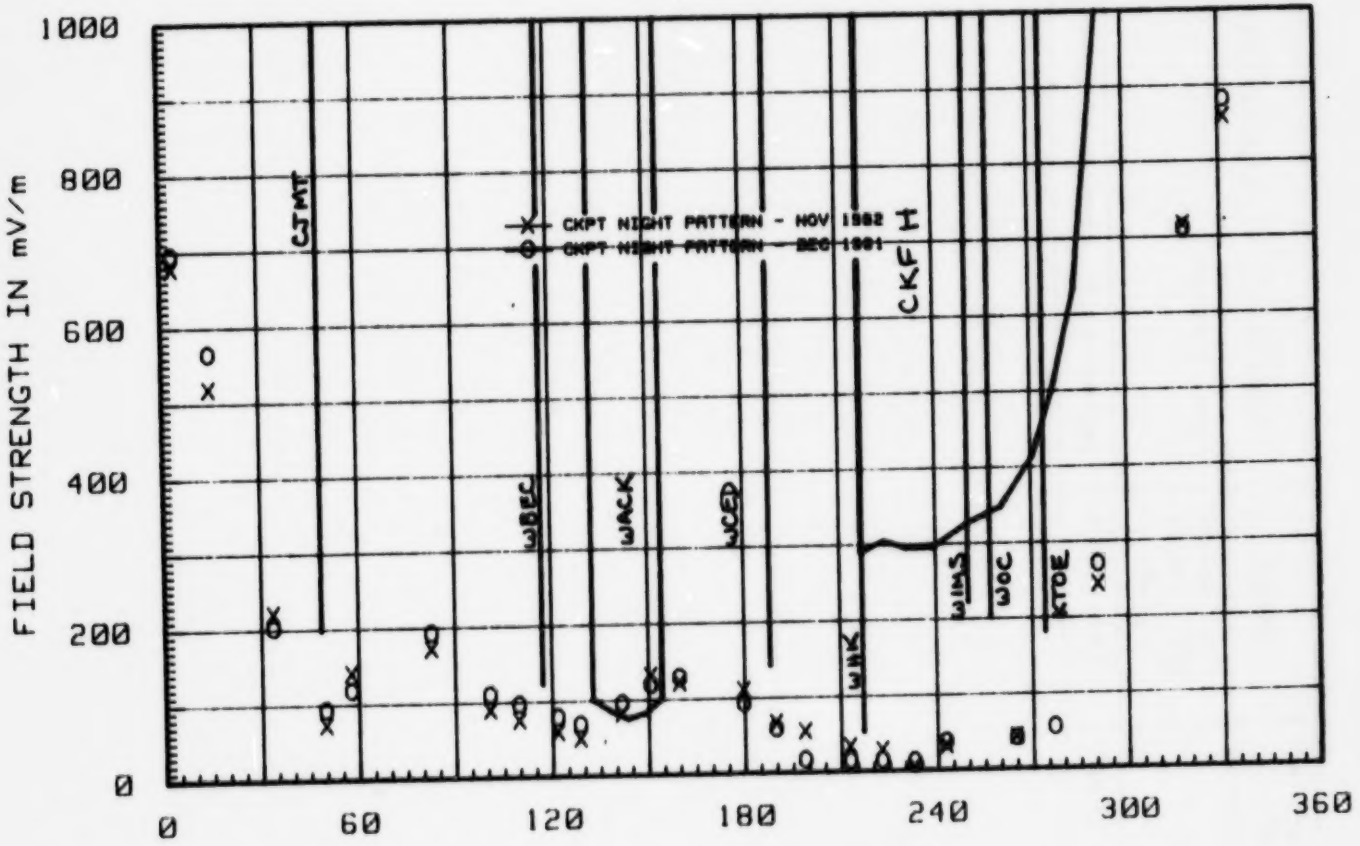
FIGURE 1
LAYOUT OF AREA AND POSITIONS OF TEST POINTS
SURROUNDING CKPT BROADCAST ARRAY



CKPT DAY PATTERN

FIELD STRENGTH CORRECTED TO 1 MILE AT 26 TEST POINTS

FIGURE 2.



CKRT NIGHT PATTERN

FIELD STRENGTH CORRECTED TO 1 MILE AT 26 TEST POINTS

FIGURE 3.

APPENDIX A

CKPT AFTER TESTS NOVEMBER 30, 1982

Affiliation	Operator	Meter	Calibration Date
CKPT	George Jones	Nems-Clarke Model 120E #1121	--
Ontario Hydro	Rick Madge	FIM21-786	April 5/82

APPENDIX B

CKPT DAY MEASUREMENTS

Test Point	Azimuth Degrees	Dec 2 1981 CKPT mV/m	Nov 30, 1982 OH mV/m	Comments On 1982 Measurements
A	4°	200	204	
B	15	165	145	Point, 8% Variation on Moving 10 feet
C	34	130	141	
D	50	130	134	
E	58	125	146	
F	83	87	86	
G	101	50	53.5	
H	110	39	38	
I	122	24	28	
J	129	25	19.3	
L	151	19	15.5	
M	160	23	29.5	
N	180	40	32.2	
O	190	62	70	
P	199	69	56	
Q	213	67	68	
R	223	100	105	
S	233	110	108	
T	243	180	198	Point, Poor max/null
U	265	255	260	Visually a Poor Point
V	277	310	252	
W	291	530	520	
X	319	160	165	
Y	332	445	480	
Z	351	320	335	

CKPT NIGHT MEASUREMENTS

Test Point	Azimuth	Dec 2 1981 CKPT	Nov 30, 1982 OH	Comments On 1982 Measurements
A	4°	160	156	
B	15	110	101	
C	34	62	68	
D	50	36.5	28.5	
E	58	49	59	
F	83	50	44.5	
G	101	24.5	19.8	
H	110	18.8	14.5	
I	122	18	13.3	
J	129	18	12.9	
K	142	29	25	
L	151	39	43	
M	160	43	40.5	
N	180	36	43	
O	190	38	43.5	
P	199	15	51	
Q	213	6.2	15	
R	223	7	13.9	
S	233	8	3.2	?Point Poor max/null
T	243	35	30	?Point Poor max/null
U	265	48	50	?Point Poor max/null
V	277	68	43	Bad Point Bad max/null
W	291	300	270	
X	319	128	129	
Y	332	375	365	
Z	351	265	255	

APPENDIX C

Point	Bearing	Radius	Description
A	4°	16,400 ft	East of Keene Road on 1st Road north of RR track in field south of road just west of creek.
B	15	18,250	Just east of next cross road, south side, by "Cedar Mountain" sign.
C	34	12,950	Road 10 - north of #7, east side of road in driveway of "Dirk Vanderwell", brown house.
D	50	10,900	Road 10 - south of #7 Hydro pole 3186, on lawn north of brown house on west side of road.
E	58	10,300	Road 10 - south of #7 "J. McCutcheon", in yard north of house on west side of road.
F	83	14,800	Road 11 - top of hill (1st hill north of 230-kV lines), in field west of road.
G	101	16,500	Road 11 - Gateway on west of road just north of white mailbox on East. "Carven Manly".
H	110	18,400	Road 11 - Top of first hill south of RR crossing on east side of road down the hill into a field.
I	122	16,400	Going west on next road "Mark Manley Welding" on north side. Just south of metal building.
J	129	14,750	Going west by willow tree on south side of road at 9th tee at golf course. Test point is in field on north side of road.

Point	Bearing	Radius	Description
K	142°	13,150 ft	Going west past Keene Road at opening in rail fence on south side of road - at start of row of cedar trees.
L	151	12,550	Into field on south side of road opposite gravel lane into house that is not there.
M	160	12,350	Going west - first opening in field on south side beyond cross road.
N	180	10,900	Going north to first rail cross fence on east side - in middle of road.
O	190	7,300	Going north, across from brown wooden cottage, in driveway north of 230 kV line.
P	199	5,500	Going north - opposite large bungalow with metal shed in front - in field through gate.
Q	213	9,900	Going north on next road west - opposite old barn with no farm house - "No Shooting" sign in field on east side of road.
R	223	8,950	At intersection with road from west. In field at east.
S	233	7,400	At next intersection on west - in lane on east side of road.
T	243	5,550	At white mail box "David Stewart" on west side of road - in field on east side of road.
U	265	4,700	In driveway on east side of road at "Kea-Mor" tank - in front of metal building north of tank.

Point	Bearing	Radius	Description
V	277°	4,600 ft	At "W.H. Millar" mailbox on east side - in driveway in front of white garage door.
W	291	4,950	On Hwy #7, just west of intersection with Bensfort Road, on north edge of road.
X	319	19,200	Way up in the suburbs just south of TP#30 for CHEX at a baseball diamond at 1st base.
Y	332	10,200	In cemetary between Little Lake and Rental places on Lansdowne Road near lake side on lane heading south by "Eastwood".
Z	351	15,500	At far end of parking lot at very top of hill at the Marine Museum Park - overlooks everything.

POOR

QUALITY

ORIGINAL